

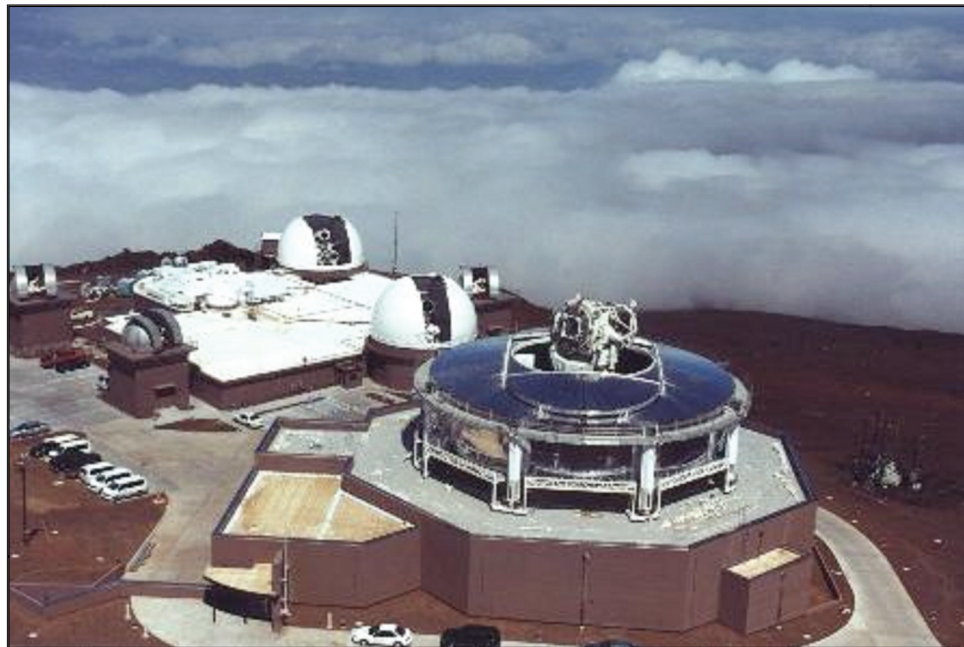


Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

DIRECTED ENERGY DIRECTORATE DEMONSTRATES HIGH-ACCURACY ORBIT UPDATES FOR LEO SATELLITES



Directed Energy Directorate scientists and engineers used the 3.6- and 1.6-meter telescopes at the Air Force Maui Optical and Supercomputing (AMOS) site to track orbiting satellites and provide high-accuracy trajectory updates. This capability is a combination of state-of-the-art telescope pointing accuracy as well as world-class astrodynamics expertise unique to the AMOS facility.



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Accomplishment

Directorate scientists made high-accuracy observations of low earth orbiting satellites at the one- to two-arcsecond levels with the 3.6- and 1.6-meter telescopes. The resulting calculation of satellite trajectories showed a significant decrease in orbit error from several hundred meters to tens of meters. This high-accuracy orbit update capability represents an unprecedented achievement in orbital prediction.

Directorate scientists then fed this data into a Kalman filter to update the calculated satellite trajectories showing a decrease in orbit error from the several- hundred-meter levels to the tens-of-meter levels. While normal satellite catalogue maintenance focuses mainly on achieving required accuracy for all satellites, this approach provides high accuracy for any specific satellite.

Background

Directorate scientists and engineers rebuilt the research and development capability of the AMOS site since taking oversight of the facilities from the Air Force Space Command. The directorate's Metrics Research and Development program made great strides in the last year due to continued sensor development, high-accuracy data collection, and the arrival of data exploitation expertise. This combination makes AMOS a national asset to the Department of Defense for space surveillance, and orbit determination and prediction research.

The directorate's AMOS Branch recently worked with the Missile Defense Agency Theater High-Altitude Area Defense program as part of a risk-reduction effort for the augmented recursive dual channel estimator for registration (ARCHER) algorithm demonstration. For missile defense, it is critical that sensors sharing data provide the data in an unambiguous manner; otherwise, inaccurate data will result in miscorrelations between actual radar tracks and externally supplied information.

ARCHER is an innovative approach for radar data registration in support of missile defense sensor networks. Directorate engineers used the high-accuracy orbit update capability at AMOS to develop "truth" orbits for this risk-reduction effort. In addition, the high-accuracy orbit update capability has applications to space control, space situational awareness, active tracking, and for Air Force missions requiring precise knowledge of satellite trajectories.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-DE-01)